Ready for the Job:

Understanding Occupational and Skill Demand in New Jersey's Utilities Industry

Electric, Gas, Water and Sewer, and Local Telephone Services

A Report of the New Jersey State Employment and Training Commission

Prepared by the
John J. Heldrich Center for Workforce Development at Rutgers University

With the Assistance of the Workforce Investment Boards of
Bergen, Cumberland/Salem, Hudson, Mercer and Passiac Counties,
and Cumberland County College, Mercer County Community College, and William Paterson University

James E. McGreevey, Governor

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Preface and Acknowledgements

The *Ready for the Job* project was developed by the New Jersey State Employment and Training Commission (SETC) with the New Jersey Departments of Labor and Education. The project was directed by Henry Plotkin, Executive Director of the SETC, and was funded by the New Jersey Department of Education. The research was conducted by the John J. Heldrich Center for Workforce Development at Rutgers, The State University of New Jersey, with assistance from the local Workforce Investment Boards of Bergen, Cumberland/Salem, Hudson, Mercer, and Passaic Counties and from researchers at William Paterson University, Cumberland County College, and Mercer County Community College.

Principal Investigator:

Carl E. Van Horn, Director and Professor
John J. Heldrich Center for Workforce Development

Research Director:

Aaron Fichtner, Director of Research and Evaluation

Contributing Authors:

Heldrich Center
Denise Pierson-Balik, Project Manager
Paget Berger, Senior Practitioner in Residence
Jennifer Cleary, Project Director
K.A. Dixon, Senior Project Manager
Sarah Gyarfas, Project Coordinator
Harriet Kass, Senior Practitioner in Residence
Laurie Harrington, Project Director

Editorial advice was provided by Kathy Krepcio, Executive Director
and Herbert Schaffner, Marketing and Communications Director

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Project Summary

Economic prosperity for New Jersey, its citizens, and its businesses depends on a well-trained workforce. This joint effort of the New Jersey State Employment and Training Commission, the New Jersey Department of Education, and the New Jersey Department of Labor is designed to collect up to date information from employers on the skill needs of eight key industries in the state. The eight industries that are the focus of this effort are: health care, finance/insurance, construction, utilities/infrastructure, manufacturing, tourism/hospitality, transportation/logistics, and information technology.

The entire effort, led by the local Workforce Investment Boards of Bergen, Cumberland/Salem, Hudson, Mercer, and Passaic counties and guided by Industry Advisory Groups, involve over thirty focus groups and eighty interviews with employers and educators. The Heldrich Center for Workforce Development at Rutgers, The State University of New Jersey, with assistance from researchers from William Paterson University, Cumberland County College, and Mercer County Community College, conducted this research to identify the skills, knowledge, and educational requirements of seventy-four select occupations and eleven areas of work. The Heldrich Center and its research partners also identified the key trends in each industry that affect skill requirements and identified strategies for meeting the key workforce challenges of each industry.

The information collected through this effort will be disseminated through this series of reports and through an Internet website (www.njnextstep.org) that will include a searchable database of each profiled occupations. This information will assist a variety of users. Students and job seekers can use this information to make decisions about education and careers. Educational and training institutions can use this information to develop courses and programs of study that will provide individuals with necessary skills. Policy makers at the state level can use this information to ensure that government resources are invested in programs and efforts that will benefit individuals and businesses.

Understanding Occupational and Skill Demand in New Jersey's Utilities Industry

Executive Summary

The utilities industry in New Jersey is an integral part of the state's economy, providing essential electricity, gas, water and sewer and local telephone services to residents and businesses. The utilities industry in New Jersey comprises four sectors: electric, gas, water and sewer, and local telephone services. The electric, gas, and sanitary services sector of the industry employs 23,010 individuals. While data for the local telephone service sector is not available, the New Jersey communications industry as a whole employs 69,900 individuals and is expected to increase by 6% from 2000 to 2010. Employment projections for the electric, gas, and sanitary services sector indicate that jobs in utilities will decline by 11% from 2000 to 2010.

Several trends have changed the utilities workforce dramatically in recent years. Corporate restructuring, spurred by deregulation of the industry, has resulted in a downsized workforce, more integration of occupations, and increased responsibilities of workers. In addition, across all sectors of the industry, the utilities workforce is aging and within the next five years, the industry anticipates a wave of retirements. Employers fear that the most experienced workers, with the most institutional knowledge, will be gone. Utilities employers are struggling to build the capacity of their current employees who are in line to be promoted to managerial and supervisory positions and to recruit a new generation of replacement workers. Finally, technological advances have increased the skill requirements of many jobs.

This report focuses on four utilities sectors selected by the Mercer County Workforce Investment Board (WIB): gas, electric, water and sewer, and local telephone service. This report, based on focus groups and interviews that include over twelve separate employers, summarizes the skill, knowledge, and educational requirements of key utilities occupations within the four sectors and identifies strategies for meeting the key workforce challenges facing the industry.

Skill Requirements of Selected Job Groups

Six occupations selected for this study by the industry advisory group largely fall into three "job groups" that share a common set of core competencies, basic educational requirements, and skill sets. While within each job group the level of skill mastery required varies, the occupations within the job group share a common continuum of competencies and tasks. In a dynamic and fluid economy, the definitions and requirements of occupations change often and can vary from one employer to another. The grouping of occupations into job groups minimizes the effect of these differences.

Labor and Skilled Trades

Occupations: telecommunications equipment mechanic, installer and repairer, water and liquid waste treatment plant and system operator	
Core Competencies:	**Sample Skills:**
Precise application of tools and materials.	Mathematics
Effective application of math concepts relevant to utilities.	Problem Solving and Critical Thinking
Understanding of and adherence to safety precautions.	Equipment Selection and Maintenance
Knowledge and effective application of technology relevant to utilities.	Operation and Control
Ability to think critically and solve problems encountered on the work site.	Installation and Repairing
Ability to work as a team with multiple occupational sectors on a work site.	Reading Comprehension

The Labor and Skilled Trades job group includes both highly skilled and entry level workers who perform the "hands on" building, repairing, installing and controlling of equipment and materials at a work site. Mastery and precise application of a range of tools and materials is necessary to succeed in this job group, particularly as new tools and materials are introduced to the industry. In addition, the ability to understand and apply technology to utilities work is critical, as work sites become more technologically complex.

Management/Supervision

Occupations: first-line supervisor/manager	Sample Skills:
Core Competencies:	Problem Solving and Critical Thinking
Use effective judgment and decision making to allocate resources and personnel to meet project budget and deadline.	Business and Accounting Skills
Communicate and coordinate the efforts of multiple project partners, vendors and workers to share common organizational goals.	Coordination
Understand and adhere to safety precautions with consistency.	Communication and Teamwork
Provide technical leadership across projects/disciplines.	Time Management
	Management of Personnel Resources

The Management/Supervision job group includes first-line supervisors and managers, occupations endemic to all utilities sectors. Emerging skills in this job group include computer and other technology skills, as the work processes and tools to complete jobs are becoming more technologically complex. Workers in this job group must have the ability to make business-minded decisions on the job. In addition, today's workforce is more diverse than in the past, and cultural sensitivity is a skill that is becoming increasingly important. Managers also must remain abreast of evolving safety and security regulations.

Computer Science Application

Occupations: network systems and data communications analyst, computer software engineer, systems software, computer systems analyst	
Core Competencies:	**Sample Skills**
Maintains and applies knowledge of current technology, demonstrating ability to troubleshoot malfunctions and resolve them quickly. Initiate innovation in implementing projects or solving technical problems. Ability to secure data competently and with the most advanced technology/ methods available. Demonstrate a concrete understanding of the utilities industry and how technology fits into the operations of the firm.	Math and Technology Problem Solving and Critical Thinking Operations Analysis Reading Comprehension Programming

Computer Science Application workers must possess strong analytical skills to maintain a firm's entire data system and quickly find solutions to system malfunctions. Workers must also maintain data and network systems for utilities firms that are becoming more technologically driven. Computer science application workers must also have the ability to translate user's non-technical descriptions of their needs into reliable designs that could be implemented as functioning systems.

Key Workforce Challenges

The utilities industry in New Jersey is facing three primary workforce challenges:

Challenge 1: Preparing Skilled, Qualified Entry-Level Workers

The aging of the industry's workforce will lead to a significant number of vacant entry- and mid-level jobs. To fill these jobs, employers must counter commonly held perceptions that utilities jobs are undesirable

Challenge 2: Attracting and Recruiting Workers

One of the greatest challenges facing the utilities industry is its ability to hire high-quality workers who possess strong basic and foundational skills to replace vacant entry- and mid-level jobs left by retirees.

Challenge 3: Upgrading the Skills of Current Workers.

The need to control costs and operate more efficiently has caused many utilities companies to restructure their operations and increase the skill demands on employees, particularly first-line supervisors.

To address these challenges, the utilities industry must work with the public and the private sector, as well as educational institutions, to create and coordinate a comprehensive set of workforce development strategies. Recommendations for doing so must recognize the complex needs of this changing industry.

Recommendations

1. Recommendations to Prepare Skilled, Qualified Entry-Level Workers

Strengthen Secondary Education

The utilities industry should incorporate key workplace readiness and cross-industry demand skills needed in the workplace into school curricula. Employers in this and other industries complain that many entry-level workers lack workplace readiness and cross-industry demand skills that are necessary to succeed in nearly all jobs in the twenty-first century. High schools should work to incorporate these key skills into the curriculum. Since cross-industry demand skills, such as math and technology skills, problem solving and critical thinking skills, communication and teamwork skills, and entrepreneurship and business skills, can be applied in any discipline, these skills can be incorporated into existing curricula.

Utilities employers should develop a certificate program for high school seniors to provide them with the skills they need to obtain an entry-level job with utilities employers. The certificate must be recognized by all New Jersey's utilities. The program should also expose students to an array of possible careers in utilities and connect them with internship opportunities with industry employers. The industry could provide a stipend to high school teachers to implement the program during after-school hours.

Strengthen and Expand Post Secondary Education and Training

The New Jersey Utilities Association and New Jersey's community colleges should expand associate's degree programs that have proven to be successful with employers. With their capacity and statewide reach, community colleges in New

Jersey are well positioned to play an important role in providing the necessary skills to individuals interested in employment in the utilities industry. The New Jersey Utilities Association should work with Mercer County Community College to export the existing utilities industry curriculum developed in collaboration with PSE&G to other community colleges throughout the state. At the same time, it should expand the program to include additional utilities firms in other sectors of the industry. The curriculum is highly regarded by both PSE&G and the community colleges and is poised to serve as an effective model for statewide expansion.

2. Recommendation to Attract and Recruit Workers

Increase Awareness of Careers in the Industry Among High School Students

Education, workforce development, and industry groups should work together to better educate students of all ages regarding the full range of career opportunities available to them, including careers in the utilities industry. Informational websites, career awareness fairs, internship opportunities, and career awareness activities integrated into school curriculums could be initiated on state and local levels to further these efforts.

Industry employers should contribute to the development of a tool kit that will inform high school teachers of the necessary skills and abilities that New Jersey students will need to qualify for jobs in the utilities industry. The tool kit should offer pedagogical examples for teaching skills in relation to the workplace students would face. The tool kit should also provide teachers and students with a clear and concise career pathway that will map out action steps a student would need to take to obtain a job in the utilities industry.

3. Recommendations to Upgrade the Skills of Current Workers

At the suggestion of employers who participated in the focus groups, New Jersey utility companies should combine resources to establish an inter-industry consortium. The consortium would develop solutions to meet the industry's training needs for supervisory workers and would strategize on how to leverage resources to support the training. By leveraging resources among each other, utilities companies share the cost of providing the technical and supervisory skills training that will be in demand in the next five to ten years.

4. Overall Recommendations

The Mercer County WIB should maintain the advisory group formed as a part of this project. The advisory group has proven to be an effective collaborative and is the strong foundation from which many of these recommendations can be implemented. First and foremost, the advisory group could be the core of the inter-industry consortium. In addition to the implementing these recommendations, this group can be the coordinating body for developing additional initiatives and for facilitating communication among employers and other stakeholders in the utilities industry. The WIB, the advisory group and the NJUA should continue its strong partnership to address the skill shortages currently plaguing the industry.

Reader's Note

Ready for the Job Identifies Four Skill Types

The Ready for the Job project identifies four types of skills that are required by or important to employers. Employers require basic skills and workplace readiness skills for nearly all jobs. Cross-industry demand skills, identified through the focus groups and interviews with employers, are important in a variety of occupations in many industries. Finally, employers require advanced technical and professional skills for many jobs. These skills are job-specific and are typically obtained through post-secondary education and training either provided by educational institutions or by employers.

Type of Skill	Definition	Level of Importance
Basic Skills	Ability to read, write, and perform basic mathematical calculations.	Criteria for most entry level or low-level or low-skilled types of jobs.
Workplace Readiness Skills	Minimum expectations for functioning in the workplace, that include meeting standards for attendance and promptness, reliability and integrity, as well as dress and decorum.	Criteria for all jobs in the workforce.
Cross-Industry Demand Skills	Broader skills sets that are in the highest demand among employers in today's economy, and indicative of success in the workforce. These cross-industry demand skills include: - Math and technology skills - Problem solving and critical thinking skills - Communication and teamwork skills - Entrepreneurship and business skills	Strength in these skill areas can lead to expanded employment opportunities and career success across industries.
Advanced Technical/ Professional Skills	Skills acquired through education and training needed to perform specific tasks and succeed in specific jobs.	Criteria for performance in specific jobs. Education and training is provided by post-secondary education institutions and /or employers.

[1] A full discussion of the methodology used for this study is included in Appendix A.

Understanding Occupational and Skill Demand in New Jersey's Utilities Industry

I. Introduction

The utilities industry in New Jersey is an integral part of the state's economy, providing essential electricity, gas, water and sewer, and local telephone services to residents and businesses. This report, based on focus groups and interviews that include twelve separate employers, summarizes the skill, knowledge and educational requirements of key occupations in the utilities industry and identifies strategies for meeting the its key workforce challenges.[1]

The Mercer County Workforce Investment Board (WIB) convened an advisory group of industry stakeholders to guide the effort.[2] This advisory group selected six key occupations within the utilities industry for in-depth skill demand analysis and provided input on research, focus group and interview participants and recommendations. The Heldrich Center and the Mercer County WIB held six focus groups with industry and educational stakeholders regarding industry trends and the skill, knowledge, and educational requirements of selected occupations. The Heldrich Center also conducted six interviews with industry human resource and management personnel regarding education, training and recruitment issues.[3]

II. Profile of the Industry and Its Skill Needs

a. Background of the Utilities Industry and its Importance to New Jersey

The four sectors of the utilities industry studied in this report are electric, natural gas, sanitary services, (water/sewerage) and local telephone service. These sectors include firms that are engaged in the generation, transmission and distribution of electricity for sale, firms that produce and distribute gas, municipal and state departments of water, sewerage and sanitation and firms that provide local telephone service.

Electric, Gas and Sanitary Services

The U.S. electric, gas, and sanitary services industry is a $216 million industry, representing 4% of the Gross National Product (GNP). The Bureau of Labor Statistics reports that there were approximately 851,000 workers in this industry in the United States in 2000. Approximately one-third of those employed in this industry work in production, installation, maintenance, or repair occupations. An additional one-fifth of those employed in this industry are in office and administrative support occupations, while approximately 13% are employed in business, management and financial occupations. In New Jersey, the electric, gas, and sanitary services industry employs 23,010 individuals. The number of jobs in the industry is expected to decrease by 11% between 2000 and 2010.[4]

The average weekly earnings for a utilities worker in New Jersey are $1,001[5], exceeding the national average of $895.[6] Mirroring the national trend, New Jersey's utilities industry is characterized by good worker benefits and a high rate of unionization.

Individuals employed in the utilities industry put in longer hours than the average for all industries, working 41.7 hours per week in 2000 compared to 34.5 hours per week for all industries.[7] Unionization is high in the industry. Nationally, more than 30% of industry employees belong to unions.[8]

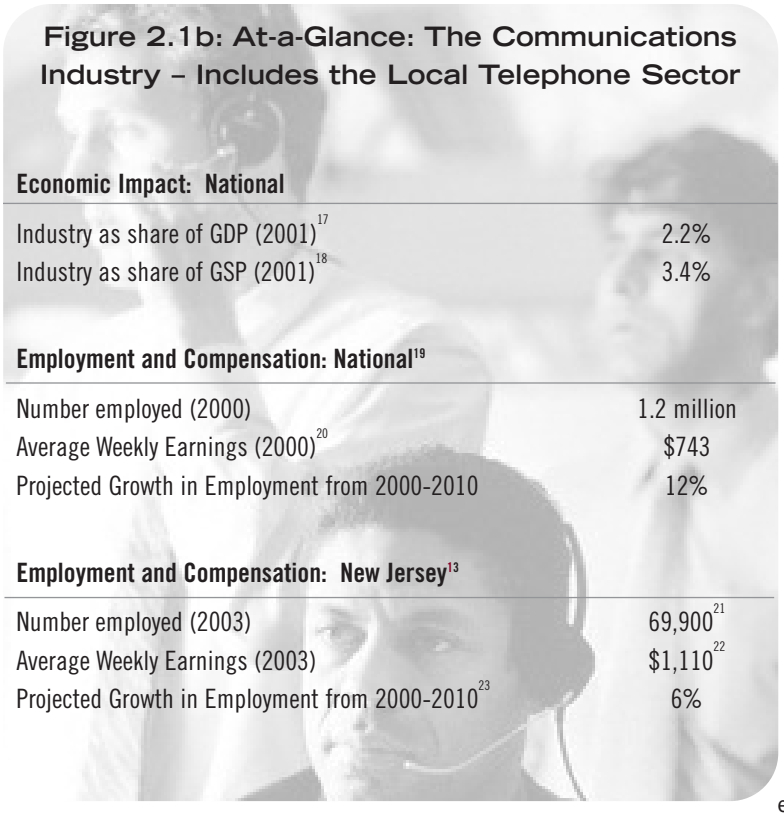
Local Telephone Service

The portions of the communications industry that provide local telephone service are included in this report because the Board of Public Utilities regulates these services in New Jersey. Statistics and employment projections are not available for

Figure 2.1a: At-a-Glance: The Utilities Industry—Electric, Gas and Sanitary Services Sectors

Economic Impact: National and State	
Industry as share of GDP (2001)[9]	2.2%
Industry as share of GSP (2001)[10]	2.1%
Employment and Compensation: National[11]	
Number employed (2000)	851,000
Average Weekly Earnings (2000)[12]	$895
Projected Change in Employment from 2000-2010	5%
Employment and Compensation: New Jersey[13]	
Number employed (2003)	23,010[14]
Average Weekly Earnings (2003)	$1001[15]
Projected Change in Employment from 2000-2010[16] -	11%

Figure 2.1b: At-a-Glance: The Communications Industry – Includes the Local Telephone Sector



Economic Impact: National	
Industry as share of GDP (2001)[17]	2.2%
Industry as share of GSP (2001)[18]	3.4%
Employment and Compensation: National[19]	
Number employed (2000)	1.2 million
Average Weekly Earnings (2000)[20]	$743
Projected Growth in Employment from 2000-2010	12%
Employment and Compensation: New Jersey[13]	
Number employed (2003)	69,900[21]
Average Weekly Earnings (2003)	$1,110[22]
Projected Growth in Employment from 2000-2010[23]	6%

local telephone service since it is part of the larger communications industry. The entire communications industry in New Jersey employs 69,900 individuals and is expected to increase by 6% between 2000 and 2010.

In recent years, corporate restructuring in the industry, spurred by deregulation of the industry in many states throughout the country, has resulted in a downsized workforce, more integration of occupations, and increased responsibilities of workers. In New Jersey, the state legislature enacted the Electric Discount and Energy Competition Act (EDECA) in 1999, partially deregulating the electric and gas sectors of the industry. This Act mandated four year reductions in energy rates and gave consumers, for the first time, the ability to choose their supplier of gas and electricity.

The end result of deregulation across the country is increased competition, leading many utilities companies to restructure their operations and make financial and strategic changes to maximize efficiency. Another result is an increase in the number of mergers or planned mergers between utilities companies. In fact, thirty of the nation's top fifty utilities' leaders recently reported that they expect to merge their company with another in the next two years. All fifty of the utilities' executives said they expect to merge with another company in the next five years.[24]

Across all sectors, the utilities workforce is aging and within the next five years the industry anticipates a wave of retirements. "Utilities companies face a critical need to identify and develop the next generation of the workforce, as an estimated seventy-six million "Baby Boomers" quickly approach retirement age," notes one major employer. A recent study conducted by the Power Systems Institute revealed 55% of utility employers expect that by 2015 more than 35% of their employees will be over the age of fifty.[25] Employers fear that the most experienced workers, with the most institutional knowledge, will be gone. Utilities employers are struggling to build the capacity of their current "pipeline" employees—those employees that are in line to be promoted to managerial and supervisory positions—and to recruit a new generation of replacement workers.

Finally, technological advances in the utilities industry have increased the skill requirements of many jobs. As a result, many incumbent workers must participate in education and training activities to stay effective on the job. Those who are unwilling to learn new skills or who are intimidated by the new technology cannot be promoted. The result is a lack of workers in the pipeline from which to develop supervisors, and causes employers to look outside the company for workers.

b. Skill Requirements of Selected Occupation Groups

The advisory group for this effort selected six occupations for in-depth skill demand analysis. The advisory group selected these six occupations to include the occupations with the largest number of annual openings or that were expected to experience significant growth in openings in the next ten years. The advisory group members used estimates and projections produced by the New Jersey Department of Labor, as well as their own knowledge of the industry to inform the selection. In addition, the advisory group considered occupations with a shortage of qualified workers. Finally, the advisory group ensured that the selected occupations represented a diversity of educational and training requirements.

In 2000, across all industries, 57,200 individuals were employed in these six selected occupations (see Fig 2.2). While employment in the electric, gas, and sanitary services industry is expected to decline between 2000 and 2010, employment in these occupations across all industries is expected to increase. The number of individuals employed in these occupations across all industries is expected to grow by 27% from 2000 to 2010 and produce 2,450 openings each year. The mean annual wages of these occupations range from $41,740 to $82,565 in 2003.

Figure 2.2: New Jersey Employment[27] and Earnings[28] in Selected Occupations* Throughout All Industries

Occupation	Mean Annual Wages 2003	Estimated Number Employed 2000	Projected Number Employed 2010	Percent Change 2000–2010	Annual Openings (due to both growth & replacement
LABOR AND SKILLED TRADE WORK					
Telecommunications Equipment Mechanics, Installers and Repairers, except line installers	50,390	10,500	9,500	-9.4%	200
Water and Liquid Waste Treatment Plant and System Operators[26]	$41,740	2,300	2,600	12.7%	100
MANAGEMENT/SUPERVISON					
First-line Supervisors/Managers of Mechanics, Installers and Repairers	$57,190	12,700	13,500	6.5%	410
COMPUTER SCIENCE APPLICATION					
Network Systems and Data Communications Analysts	$66,720	3,700	5,700	53.9%	210
Computer Software Engineers, Systems Software	$82,565	7,600	12,600	66.1%	550
Computer Systems Analysts	$75,235	20,400	28,500	39.3%	980

* Totals may not add due to rounding. Employment data are rounded to 100. Percent changes are based on unrounded data.

The six selected occupations in the utilities industry largely fall into three "job groups" that share a common set of core competencies, basic educational requirements, and skill sets (see Fig. 2.3). These include labor and skilled trade positions, including communication equipment mechanics, installers and repairers and water and liquid waste treatment plant and system operators; management/supervision positions, including first-line supervisors/managers of mechanics and installers and repairers; and computer science application positions, including network systems and data communications analysts, computer software engineers and computer systems analysts. A description of these selected occupations, their skill requirements and key workforce issues can be found in Appendix D. A searchable database of all selected occupations in the eight industries is available at www.njnextstep.org.

Figure 2.3: Profile of Utilities Industry Job Groups

Job Groups	Description of Job Group	Occupations Included in Job Group	Education/Training Required or Preferred by Employers	Core Competencies[29]	Sample Occupational Skills
Labor and Skilled Trade Work	Work that involves building, repairing, installing, controlling, or operating equipment and materials. Also includes work such as cleaning buildings, landscaping grounds, and preparing foods	Communication Equipment Mechanics, Installers and Repairers Water and Liquid Waste Treatment Plant and System Operator	Union workers: HS diploma/GED and Apprenticeship, which includes classroom and on-the-job (OJT) training. Non-union workers: OJT	Select and use tools and materials with precision to meet task specifications. Apply knowledge of math concepts relevant to industry Understand and adhere to safety precautions with consistency. Apply knowledge of technology concepts relevant to industry. Demonstrate initiative and an ability to think critically and solve problems in a time and cost efficient manner. Demonstrate ability to work cooperatively as a team member towards organizational goals, relying on strong knowledge of roles of colleagues and oneself. Some positions in this job group require workers to conduct quality control analysis, relying on thorough knowledge of product and service delivery specifications.	Mathematics Problem Solving and Critical Thinking Equipment Selection and Maintenance Operation and Control Installation and Repairing Reading Comprehension
Management/ Supervision	Work that involves supervising, coordinating and planning work of site and staff.	First-line Supervisors/Managers of Mechanics, Installers and Repairers	First-line Supervisors/Managers of Mechanics, Installers and Repairers HS Diploma/GED Work Experience Bachelor's degree preferred for managers, especially among those applicants who do not have past experiences with the hiring company Associate's degree typically preferred for supervisors	Use effective judgment and decision making to allocate resources and personnel to meet project budget and deadline. Communicate and coordinate the efforts of multiple project partners, vendors and workers to share common organizational goals. Understand and adhere to safety precautions with consistency. Provide technical leadership across projects/disciplines.	Problem Solving and Critical Thinking Business and Accounting Skills Coordination Communication and Teamwork Time Management Management of Personnel Resources

Figure 2.3: Continued

Job Groups	Description of Job Group	Occupations Included in Job Group	Education/Training Required or Preferred by Employers	Core Competencies[29]	Sample Occupational Skills
Computer Science Application	Working with computer networking and data software systems.	Network Systems and Data Communications Analyst Computer Systems Analyst Computer Software Engineer, Systems Software	HS Diploma/ GED Bachelor's degree preferred Often technical certification required	Maintains and applies knowledge of current technology, demonstrating ability to troubleshoot malfunctions and resolve them quickly. Initiate innovation in implementing projects or solving technical problems. Ability to secure data competently and with the most advanced technology/methods available. Demonstrate a concrete understanding of the industry and how technology fits into the operations of the firm.	Math and Technology Problem Solving and Critical Thinking Operations Analysis Reading Comprehension Programming

While within each job group the level of skill mastery required might vary, the occupations within the job group share a common continuum of competencies and tasks. In a dynamic and fluid economy, the definitions and requirements of occupations change often and can vary from one employer to another. The grouping of occupations into job groups minimized the effect of these differences.

Labor and Skilled Trade Work

Description and Skill Requirements

The Labor and Skilled Trades job group includes both highly skilled and entry level workers who perform the "hands on" installing, repairing, building, and controlling of equipment and materials on a job site. Occupations such as communication equipment mechanics, installers and repairers, and water and liquid waste treatment plant and system operators fall under this job group. Mastery and precise application of a range of tools and materials are necessary to succeed in this job group, particularly as new tools and materials are introduced to the industry. In addition, the ability to understand and apply math concepts and technology to utilities work is critical, as work sites and jobs become more technologically complex. Employers cite communication skills, such as writing and explaining a problem to a customer, as important skills workers must possess to succeed in the utilities industry. Further, employers strongly emphasize the importance of understanding and strictly adhering to safety regulations. All employers agree that critical thinking, troubleshooting, and problem-solving skills are necessary for workers to possess when they arrive on a work location, as workers are likely to encounter a range of issues and problems that require them to apply their knowledge.

Workers within this category can either be union or non-unionized. Union workers are most likely to be found in the gas, electric, water and telephone sectors. Generally, union workers start out in entry-level positions and advance in the company according to seniority status and education and training. Regardless of union status, all employers agree that workers in this category must have a high school diploma or a general equivalency diploma (GED). For the water sector, workers in this occupational job group are required to have a T-1 or W-1 state license. For the gas and electric sectors, there are industry-specific licenses and certifications that are sometimes required for employment.

Emerging Skills

The key emerging skills for labor and skilled trades workers are the ability to integrate sophisticated technology into their work tasks and the ability to conform to increasingly strict security and safety regulations and procedures.

Workforce Issues

Several trends are influencing the demand for workers with these skills sets, including the aging of the utilities workforce in New Jersey. One employer reports that the average age of his employees is 44. Another employer says that over 50% of his workforce is at retirement age. Since management positions in the utilities industry are still primarily filled by pro-

moting from within, it is likely that many labor and skilled trades workers will be promoted to fill positions of retirees. The consequence is a drain on current labor and skilled trades workers and a greater demand to fill those positions to replenish the supply.

At the same time, employers tell us that there are not enough qualified applicants to hire. Most employers admit that finding employees with the appropriate set of basic skills, particularly math, is a serious challenge. Employers report that while young people interested in the industry possess the necessary degree of technological savvy, they lack the fundamental mechanical aptitude that is essential to fill these positions. According to one employer, "younger employees come to the industry not knowing basic technical skills—can't use a shovel or a clutch but they amaze you with their knowledge of computers. There is a gap."

In conducting focus groups and interviews with employers in the utilities industry, employers stressed the importance of strong basic skills. According to them, if a worker possesses strong basic skills, they also tend to possess the aptitude to be trained effectively on occupational skills. For employers, trainability is critical. Many employers emphasized that their preference is to hire motivated individuals with strong basic skills, even if they do not have any prior experience in the field. Employers maintain, "If a worker can read, write and do math, I will teach them the rest." In addition, employers agree that labor and skilled trades workers must have the ability to learn quickly. Technology changes so rapidly and workers must be able to adapt quickly and with great precision in the face of an upgraded tool or safety procedure. Next, employers agree they need employees who are willing to adapt to the lifestyle that often is associated with a job in the utilities industry. In many instances, this means working second or third shift, being on call, and doing physical labor like climbing polls and digging trenches. As described by employers, the pay scale in utilities is good but it is often hard to find workers willing to adopt the lifestyle.

Management/Supervision

The Management/Supervision job group includes first-line supervisors and managers of mechanics, installers and repairers. Employers tell us that workers in these positions are often drawn from the ranks of the labor and skilled trades job group, and include workers who have been in the industry for many years, have worked their way up to manager or supervisor and have extensive experience in the industry. For these jobs, work experience is currently more important to employers than formal education such as a bachelor's degree. As in other occupational categories, employers emphasize the importance for supervisors to have strong verbal and written communication skills.

Emerging Skills

The key emerging skills in Management/Supervision work are the ability to make critical business-oriented decisions on the job, stay abreast of changes in municipalities' regulations, demonstrate improved cultural sensitivity toward the utility employees and customer base, and demonstrate better finance, and accounting skills.

Workforce Issues

According to employers, deregulation forced utilities employers to tighten their workforce and impose greater responsibilities on their workers, specifically their supervisors and managers. Managers are under more pressure to possess strong business and accounting acumen, as well as strong skills in marketing. According to one utilities executive, "managers need to know how money is made." For this reason, employers agree that if they hire from outside the company, they generally look for candidates with degrees in business management. Engineering is also cited as a preferred major when hiring a college graduate. Since all sectors of the utilities industry have been consolidating to enhance their efficiency, employers tell us that supervisory workers must be able to multi-task and "wear many different hats." For example, first-line supervisors in the utilities industry must be able to quantify employee performance, troubleshoot a myriad of real and potential problems on the worksite, maintain good labor relations with the unions and communicate to workers their role in the larger mission of the firm. Specific training is not necessarily provided to develop these skills and, according to one employer, "a supervisor is expected to learn on his or her own." The higher levels of responsibility, the transition of mindset from an often unionized position to a management one and the stress that usually accompanies supervisor positions, often make it more difficult to encourage older, more experienced labor and skilled trades workers to pursue promotion into these jobs.

Computer Science Application

Description and Skill Requirements

The Computer Science Application job group includes occupations such as network systems and data communications analysts, computer software engineers, and computer systems analysts. Workers in this job group are technologically adept and do not require a bachelor's degree, but one is often preferred. However, computer science application workers generally are required to have extensive technical training to stay updated on the latest advances in technology. Employers cite technical programs at proprietary schools as good programs from which to hire computer science application workers.

Workers in this job group must possess strong analytical skills to maintain a firm's entire data system and quickly find solutions to system malfunctions without service disruption. Also, as overall industry operations become more technologically driven, workers in this category become more critical to the everyday operations by maintaining all the data and ensuring that all network systems operate effectively. Finally, workers

in computer science application must be able to translate the user's non-technical descriptions of their needs into reliable designs that could be implemented as functioning systems.

Emerging Skills

The key emerging skills in the computer science application job group for the utilities industry are the ability to stay knowledgeable about different software programs and systems that could enable the company to operate more efficiently and the ability to maintain the highest levels of security and protection of the computer systems against hazardous system malfunctions that could cripple the state.

Workforce Issues

The critical issue facing the computer science application job group is the need for workers to consistently upgrade their skills to keep up with advances in technology and stay ahead of the increasingly sophisticated user community. As new software is developed to enable businesses to work smarter, computer science application workers must have the capacity to incorporate quickly the changes into firms' networks and systems. Today, employers tell us that they do not have a great deal of difficulty in finding these workers. They also note that computer science application workers are, for the most part, well trained and capable to perform their jobs.

III. Key Workforce Challenges

As a result of an aging utilities workforce, corporate mergers and restructuring and an increased demand in basic and advanced skills, the utilities industry faces three critical challenges. First, it must attract more qualified entry-level workers with strong basic and cross-industry demand skills. Second, the utilities industry will have to deflect negative misperceptions of jobs in the utilities industry. Finally, as job titles are consolidated and workers, particularly supervisors, assume more responsibilities, they will have to possess higher skills and be much more prepared to make important decisions on the job.

> **Challenge 1: Preparing Skilled, Qualified Entry-Level Workers.** One of the greatest challenges facing the utilities industry is its ability to hire high quality workers who possess strong basic and cross-industry demand skills to replace vacant entry- and mid-level jobs left by retirees.

Replenishing the supply of retired workers is complicated by what employers describe as an insufficient supply of qualified workers. Human resource representatives in the industry report that they have difficulty filling entry-level jobs because too few candidates pass their screening exam. Screening exams for one prominent utilities company in New Jersey tests an individual's basic reading comprehension and math skills. According to this firm, the basic math section of the screening exam poses the most serious challenge to a potential candidate's success. According to one employer, "most people struggle with math. Schools are not giving students the math skills they need." In New Jersey, most entry-level and technical utilities workers are expected to have at least reading and math skills at the eighth grade level. Employers in the industry tell us that while technology does compute some of the math for workers, they still must understand advanced mathematical concepts and how they relate to their job task even if they are not doing the actual computation.

> **Challenge 2: Attracting and Recruiting Workers.** The aging of the industry's workforce will lead to a significant number of vacant entry- and mid-level jobs. To fill these jobs, employers must counter commonly held perceptions that utilities jobs are undesirable.

The utilities workforce is aging and employers anticipate that many of their workers will soon retire. Employers report that the recruitment of qualified entry-level workers is exacerbated by the negative perception that many young people have of the industry. The seemingly constant mergers and downsizing has discouraged some young workers from pursuing a career in what appears to be an unstable industry. At the same time, there is a misperception that utilities positions do not have competitive pay and benefits. Employers also believe that the physically demanding nature of many utilities jobs, such as poll climbing and pipe drilling, discourage younger workers. Employers conclude that the misunderstanding about working in the utilities industry is due to the lack of information available to students and job seekers. The reality, employers report, is that utilities jobs offer competitive salaries and, in most cases, include comprehensive benefits.

> **Challenge 3: Upgrading the Skills of Current Workers.** The need to control costs and operate more efficiently has caused many utilities companies to restructure their operations and increase the skill demands on employees, particularly first-line supervisors.

Corporate mergers and restructuring has resulted in job consolidation and streamlined operations. As a result, many workers have assumed broader job responsibilities to achieve the same or greater level of productivity. Workers now must possess a higher-level set of skills and abilities, including more business acumen.[30] In particular, employers emphasize that supervisors will have to possess marketing and public relations skills, as well as accounting and business management skills. Finding workers with this particular mix of skills necessary for a utilities management job is difficult. In fact, 40% of respondents to a recent survey of 75 utilities employers in New Jersey report a moderate or great deal of difficulty in attracting good quality managers.[31]

In the utilities industries, most supervisors are promoted from the ranks of skilled trade workers. However, as the responsibilities of supervisors have broadened and become more high skilled, many companies are finding that skilled trades workers are unwilling to assume the increased level of responsibility. This is particularly true for the large percentage of utilities employers who are faced with a workforce near retirement and "pipeline" workers who are more inclined to finish out their careers without the additional stress that comes with the higher position and increased education.

IV. Current Efforts to Meet the Challenges

Faced with an aging workforce, the need for employees to possess higher skills and the insufficient supply of new employees with basic skills sets, employers have implemented a number of different strategies to address their present and future workforce challenges.

Strategies to Attract Skilled, Qualified Entry-Level Workers

Attracting New Workers. To attract new workers to the utilities industry, and to counteract the negative perception among younger workers about the types of jobs in utilities, some employers are working with the secondary school system to promote awareness and exploration into different types of utilities careers. The intent is to excite young people about the various career paths one can take, and to attract higher quality workers to apply for utilities jobs. Today, however, recruitment at this level is still in its infancy. According to a recent survey commissioned by the Mercer County Workforce Investment Board, relatively few employers rely on school-to-career programs to fill jobs at any level, although the majority of those that do report some degree of success.[32]

One strategy aimed at recruiting qualified employees is Verizon NJ's "In Roads" program. The In Roads program recruits minority college students for a paid summer internship that gives them real, hands-on experience in the field. Upon graduation, these students are ready for employment with firm-specific skills to apply on the job. This program is highly regarded as an effective recruitment strategy by Verizon. Due to recent budget setbacks, however, the company has temporarily suspended the program, but indicates that it will revive the program in the future.

Detroit Edison, an energy company in Detroit, Michigan, is meeting the recruitment challenge through effective industry/education partnerships. The company is an active sponsor of the Exploring Program, an initiative associated with the Boy Scouts. In this after-school initiative, Detroit Edison employees mentor 10th, 11th and 12th grade students about careers in computer science, utilities, engineering, and business administration. Students explore careers, special interests, and skills by interacting with corporate professionals.

The program is designed to have students meet with employees twice per week to explore different jobs and train students in the basic skills required to perform jobs. Staff members help students obtain practical hands-on experience and examine how these fields apply in the every day work world. By the time computer students complete their "post" with Detroit Edison, they are expected to apply the knowledge they have learned by creating Internet web pages and giving a presentation on colleges and universities that specialize in computer science.

The Xcel Energy Corporation, in Minneapolis, Minnesota, uses mentoring and job shadowing as a way to raise awareness of utilities careers among students. In this program, students are given a closer look at some utilities careers during the company's "job shadow" days, which create learning experiences that expose them to the world of professional technical employment. Students spend a day with information technology employees, getting a first-hand look at how those employees do their jobs and what skills they utilize.

The Xcel Energy Corporation also has developed an internship program that offers students an even closer look at utility industry careers. Interns at the company's Riverside Generating Plant work in several different plant areas—mechanical and electrical maintenance, operations, engineering, instrumentation and controls, coal yard and plant safety—receiving hands-on experience in each. Xcel Energy has offered student internships in other areas of the company, as well.

Another example of using professionals in the field to provide a mentoring or job shadowing experience to increase interest in the industry is Public Service Company of New Mexico's (PNM) partnership with the Albuquerque Public Schools (APS) to implement the Join-A-School program. PNM, a combined electric and gas utility, has been involved in a partnership with elementary and middle schools since the mid-1990s. Since then, more than 700 students have worked at the company's utility after school program as part of the Albuquerque Business Education Compact (ABEC), and many have gone on to be hired by PNM.

PNM professionals from the company's Human Resources department make classroom visits at schools throughout the state of New Mexico and talk about everything from safety issues to what classes will prepare a young person for a career within the company. PNM employees also participate in the Junior Achievement Program.

In addition to mentoring, some utilities companies are developing instructional materials to improve the instructional content and relate student lessons to the utilities industry. The Xcel Energy Corporation had distributed a careers video, "Let's Get Technical—Careers in Energy," for high school students. The objective of the video is to make students aware of technical careers at natural gas and electric companies and inspire them to begin preparing for those positions. The video shows the scope of utility company operations and how it provides the power for virtually everything the customers do. Xcel's operations span a spectrum of job functions and locations, from wind farms to hydroelectric dams to coal- and natural gas-fired power plants.

Teacher development is another way in which utility companies can increase awareness and interest in the utilities industry. Both PNM and Xcel Energy Corporation have programs that instruct teachers on how to relate classroom instruction to technical careers. For example, the Rio Grande Collaborative, in New Mexico, provides professional development for educators on how to make their lesson plans more relevant to careers in utilities. PNM also offers teachers summer internship opportunities within the companies.

Some companies conduct outreach to potential employees to garner interest in the industry by participating on workforce investment boards (WIBs). Verizon, for example, maintains a

strong presence on twelve of the fifteen New Jersey WIBs. Others reach out to their local One-Stop Career Center and work with career counselors to tap into their best job-seeking customers. Many employers told us that they look to the military to pull in qualified candidates because of their typically solid work ethic and training in the trades. Still others told us they use professional organizations such as Women in Trades.

Strategies to Prepare Skilled, Qualified Entry-Level Workers

To improve the quality of new workers entering the utilities industry, some employers have developed partnerships with educational institutions. Such partnerships allow employers to help shape curriculum content to improve the preparedness of potential workers for jobs in the industry.

A number of companies in New Jersey and in other parts of the country have developed partnerships with secondary education to ensure that high school graduates are prepared for employment in the industry or for post-secondary education. For example, staff of New York State Electric and Gas Corporation (NYSEG) participates in a variety of educational programs for high school students with an emphasis on energy awareness, safety and career education. One such program, the Western New York Youth Summit, provides students in a ten-county area the opportunity to interact with community and business leaders. The Summit introduces students to the business world and makes them more aware of businesses' needs and life in the workplace. This helps create student interest in education, encourages learning through practical application, increases student self-esteem, and enhances fundamental communication skills.

In North and South Carolina, employees of Duke Power host teacher workshops for middle school and elementary school teachers on energy and the environment. The goal of the program is to provide hands-on assistance to teachers who are looking for help bringing electricity and energy issues directly into the classroom. These workshops, which are free to all attendees, also focus on natural resources stewardship and environmental ethics. The educator workshops are designed to provide balanced, educationally sound, state-of-the-science information on the generation and delivery of electricity and the impact on the environment, as well as provide continuing education credits for teacher certification. Additionally, teachers are given notebooks, resource handbooks and lesson plans to directly integrate what they have learned into classroom curriculum.

In New Jersey, PSE&G, in partnership with Mercer County Community College (MCCC), established a career academy at Trenton Center High School (TCHS). As part of the engineering job group at the school, students in electrical engineering courses use a laboratory paid for by PSE&G and designed by MCCC staff members. During their second semester of junior year, participants take Fundamentals of Electronics. Subsequently, seniors take Introduction to Electronics I and Introduction to Electronics II. Additional math instruction is provided to students on an as needed basis.

Students who are interested in a career in the utilities industry can continue their studies at MCCC after graduation and earn an associate of applied science degree in Energy Utility Management. The curriculum for this program was developed through a partnership between MCCC and PSE&G. The program is offered through MCCC's engineering department and provides students with the opportunity to acquire the skills and knowledge necessary for immediate entry into energy utility careers or transfer to an advanced degree program in another related field. The program combines traditional, general academic education with a hands-on education in energy utility technologies at a state-of-the-art training facility owned and maintained by PSE&G. General educational elements include: mathematics, communications, leadership, basic circuit analysis, and physics. Energy utility technology elements include energy delivery system, skills for electrical construction and maintenance, underground operations, engineering assistance and gas installation, maintenance, design, and appliance service.[33] During the tenure of the program, students receive paid summer internship opportunities. While there is the explicit understanding that the degree does not guarantee employment, the placement rate for last year was very high. Educators at Mercer Community College are very excited by the partnership and hope similar models can be replicated at other colleges and in other industries. According to educators, the most important component that must be present for the partnership to work, however, is that "the jobs have to be there."

In Ohio, FirstEnergy Corporation has developed a similar partnership with regional colleges to create the Power Systems Institute. FirstEnergy provides the firm-specific training in regard to safety compliance, technical utility training, obtainment of a Class "A" commercial drivers license, and certification in first-aid and CPR. The college provides curriculum in technical and non-technical education. For example, technical courses include: Electrical Fundamentals, Electrical Utility Distribution Systems, and Electrical Codes and Standards. Non-technical courses include: Conceptual Physics, Advanced Math, Intermediate Algebra, and Trigonometry, Computer Software Skills, Writing 1 and 2 and Communication Theory and Practice. The program yields an associate's degree that is offered at five colleges.

Strategies to Upgrade the Skills of Current Workers

Employer-provided training is the most utilized and, according to employers, the most effective strategy to increase employees' skill capacity, particularly in the areas of safety, regulatory compliance, and cross training, and improve the quality of workers in the "pipeline" for supervisory positions. Most employer-provided training is provided in-house. While smaller utilities employers bemoan the financial strain associated with providing in-house training, larger companies have designated divisions of their firm whose purpose is stay abreast of recent changes to safety regulations and prepare training workshops. Some employers, like Consumers New Jersey Water Company, rely on their parent companies to provide the resources they need to administer updated training workshops. Resources typically are in the form of training content and materials and

instructors. Often, New Jersey utilities firms provide in-house training in a train-the-trainer format where a supervisor attends the full training and is responsible for relaying the training to his/her crew.

Cross-training ("training across a skill line, such as teaching a mechanic to do electrical work") has been useful in handling the loss of skilled labor in recent years. Although the application of cross-training raises concerns that safety is being compromised when a worker is stretched across multiple fields, it provides flexibility to the firm in meeting its labor needs. Nevertheless, most employers cite safety as among the most common training topic. Others topics included supervisory skills training and back hoe driving. Training also is fundamental to understanding government industry regulations, and is considered a more proactive approach to skill shortages, as compared to outsourcing.[34]

For improving occupational skills of incumbent workers, Verizon uses NetLearn, an internal, on-line education and training resource. According to Verizon, "an employee's mobility within the company is endless if they are self-motivated to improve themselves." NetLearn is available to all employees to train themselves on their own time.

To advance their technical expertise, workers typically must pursue higher levels of education to acquire the necessary certification or credentials. Many companies offer tuition reimbursement or tuition remission for workers who are interested in further education. However, one employer notes that "companies encourage employees to get the training they need but a lot of people don't take advantage."

V. Recommendations

The utilities industry is faced with a number of challenges in meeting their current and future labor and skill needs. First, utilities companies are continually restructuring their operations and increasing the skill demands and the responsibilities of their workers, particularly first-line supervisors. Second, not enough new workers are entering the utilities industry with adequate skills. In recognition of this issue, the industry and its partners already have developed a number of programs and initiatives to increase both the supply and the skill level of utilities labor both in New Jersey and nationwide. However, the New Jersey utilities industry should consider additional steps that would support and build upon these efforts, further strengthening the current utilities labor force and increasing the pipeline of future workers. These include:

1. Recommendations to Prepare Skilled, Qualified Entry-Level Workers

Strengthen Secondary Education

Incorporate Key Workplace Readiness and Cross-Industry Demand Skills Needed in the Workplace into School Curriculums. Employers in this and other industries complain that many entry-level workers lack workplace readiness skills and cross-industry demand skills that are necessary to succeed in nearly all jobs in the twenty-first century world of work. High schools should work to incorporate these key skills into the curriculum. Since cross-industry demand skills, such as math and technology skills, critical thinking and problem solving skills, communication and teamwork skills, entrepreneurship and business skills, can be applied in any discipline, these skills can be incorporated into existing curricula.

Workplace readiness skills should also be integrated into the high school experience as well. While still in its infancy, the SchoolCounts! Program, in place in several counties in New Jersey and developed by the Business Coalition for Education Excellence at the New Jersey Chamber of Commerce, may be a promising approach. This program rewards students by issuing an employer-recognized certificate to students for promising behavior such as consistently high attendance rates, above average academic performance, finishing high school on-time and taking initiative by enrolling in extra courses. Local employers enrolled in the program agree to accept the SchoolCounts! Certificate as evidence of workforce preparedness.

Develop a Certificate Program for High School Seniors. Utilities employers should develop a certificate program for high school seniors to provide them with the skills they need to obtain an entry-level job with utilities employers. The certificate must be recognized by all New Jersey's utilities. The program should also expose students to an array of possible careers in utilities and connect them with internship opportunities with industry employers. One mechanism for implementing such a program would be to provide a stipend to high school teachers to assist them to implement such a program during after-school hours.

Strengthen and Expand Post Secondary Education and Training

Expand Associate's Degree Programs. With their capacity and statewide reach, community colleges in New Jersey are well positioned to play an important role in providing the necessary skills to individuals interested in employment in the utilities industry. The New Jersey Utilities Association should work with Mercer County Community College to export the existing utilities industry curriculum developed in collaboration with PSE&G to other community colleges throughout the state. At the same time, it should expand the program to include additional utilities firms in other sectors of the industry. The curriculum is highly regarded by both the PSE&G and the community colleges and is poised to serve as an effective model for statewide expansion.

2. Recommendations to Attract and Recruit Workers

Increase Awareness of Careers in the Industry Among High School Students

Create Better Career Education Opportunities for Students. Employers note that many young people do not have an accurate understanding of the nature of work in the utilities industry, nor do they understand what career opportunities exist. Education, workforce development, and industry groups should work together to better educate students of all ages regarding the full range of career opportunities available to them, including careers in the utilities industry. Informational websites, career awareness fairs, internship opportunities, and career awareness activities integrated into school curricula could be initiated on state and local levels to further these efforts.

Develop a Tool Kit for High School Teachers. Industry employers should contribute to the development of a Tool Kit that will inform high school teachers of the necessary skills and abilities that New Jersey students will need to qualify for jobs in the utilities industry. The tool kit should offer pedagogical examples for teaching skills in relation to the workplace students would face. The tool kit should also provide teachers and students with a clear and concise career pathway that will map out action steps a student would need to take in order to obtain a job in the utilities industry.

Fig. 5.1: Recommendations by Stakeholder

	State Government	Workforce Investment Boards	Secondary Education	Post Secondary Education	Employers/ Associations	Unions
Recommendations to Prepare Skilled, Qualified Entry-Level Workers						
Strengthen Secondary Education						
Incorporate Workplace Readiness and Cross-Industry Demand Skills Needed in the Workplace into School Curriculums	x		x			
Develop a Certificate Program for High School Seniors			x		x	
Increasing the Awareness of Careers in the Industry Among High School Students						
Create Better Career Education Opportunities for Students	x	x	x			
Develop a Tool Kit for High School Teachers			x		x	x
Establish an Inter-Industry Consortium to Address Training Needs		x			x	x
Maintain the Advisory Group		x	x	x	x	x

3. Recommendations to Upgrade the Skills of Current Workers

Establish an Inter-Industry Consortium to Address Training Needs. At the suggestion of employers who participated in the focus groups, New Jersey utility companies should combine resources to establish an inter-industry consortium. The consortium would develop solutions to meeting the industry's training needs for supervisory workers and would strategize on how to leverage resources across all New Jersey firms to support the training. By leveraging resources among each other, utilities companies share the cost of providing the technical and supervisory skills training that will be in demand in the next five to ten years.

4. Overall Recommendations

Maintain the Advisory Group. The Mercer County WIB should maintain the advisory group formed as a part of this project. The advisory group has proven to be an effective collaborative and is the strong foundation from which many of these recommendations can be implemented. First and foremost, the advisory group could be the core of the inter-industry consortium. In addition to the implementing these recommendations, this group can be the coordinating body for developing additional initiatives and for facilitating communication among employers and other stakeholders in the utilities industry. The WIB, the advisory group, and the NJUA should continue its strong partnership to address the skill shortages currently plaguing the industry.

VI. Conclusion

Public utilities provide the essential infrastructure to the health and vitality of our economy, our safety and our lives. To keep the industry vital and prepared for the future, it must have a highly trained and qualified workforce. The utilities industry, however, is facing several workforce development challenges, including corporate restructuring, a demand for higher incumbent worker skills, and increased demand for replacement "pipeline" workers with strong basic skills.

New Jersey employers cite the need for greater emphasis on vocational education to teach young workers the mechanical aptitude they will need to perform jobs in the utilities industry. In addition, employers agree that today's young workers are unprepared for the workplace and, in general, lack basic math and literacy skills to pass the most basic hiring exams. They also tell us that, due to downsizing and restructuring, workers are forced to take on additional responsibilities that require more advanced skills and training. Finally, many employers cite an aging workforce that will soon retire and take with them valuable institutional knowledge. Employers must focus on building the capacity of their current workforce, and develop that of the incoming workforce, to stay effective.

Utilities employers have implemented a number of programs and strategies to improve the skills of incumbent workers and build the capacity of the future utilities workforce. The industry should continue to build on partnerships with educational institutions to expose students to careers in utilities and the types of skills and knowledge they will confront on the job. As a starting point for developing these partnerships, utilities employers, and educational institutions should convene a summit, to be held at least once per year, to discuss developments in industry workforce challenges, and strategies to overcoming them. Utilities employers should also combine their resources and expertise and develop a centralized inter-industry consortium to address training needs and to jointly prepare the next generation of high quality utilities management workers. In addition, industry leaders should jointly create a marketing strategy that targets teachers, students, guidance, and career counselors and job seekers.

State and local governments have an important role in improving the utilities workforce. The State of New Jersey should have developed a web site where students and counselors can find guidance on what types of jobs are available, what they can expect on the job, and how to prepare for those occupations in New Jersey's leading industries. Finally, the Mercer WIB should serve as the driving force for strengthening the connection between industry and education partners to respond to each other's needs. One strategy for strengthening this connection is to maintain and expand the advisory group formed as part of this project. This group can act as the catalyst for new initiatives and provide a valuable communication venue for utilities employers to address current and future workers and skills needs crucial to their success in New Jersey.

[2] A full list of Advisory Group members is included in Appendix B.

[3] A full list of focus group and interview participants is included in Appendix C.

[4] New Jersey Department of Labor. *New Jersey Population and Employment in the 21st Century*. April 2003

[5] New Jersey Department of Labor. *Occupational Employment Statistics Wage Survey: 2003 Edition*. January 2003. <http://www.wnjpin.state.nj.us/OneStopCareerCenter/LaborMarketInformation/lmi23/index.html>

[6] For non-supervisory workers only. Bureau of Labor Statistics, U.S. Department of Labor. "Public Utilities." *Career Guide to Industries, 2002-2003 Edition*. <http://www.bls.gov/oco/cg/cgs018.htm>

[7] Bureau of Labor Statistics, U.S. Department of Labor. "Public Utilities." *Career Guide to Industries, 2002-2003 Edition*. <http://www.bls.gov/oco/cg/cgs018.htm>

[8] Bureau of Labor Statistics, U.S. Department of Labor. "Public Utilities." Career Guide to Industries, 2002-2003 Edition. <http://www.bls.gov/oco/cg/cgs018.htm>

[9] US Department of Commerce, Bureau of Economic Analysis. *Gross Domestic Product by Industry*. Electric, gas and sanitary services http://www.bea.doc.gov/bea/dn2/gpoc.htm#1994-2001

[10] New Jersey Department of Labor. "Gross State Product for New Jersey by Industry, 1977-2001 (Millions of Current Dollars)." 7 July 2003. <http://www.wnjpin.net/OneStopCareerCenter/LaborMarketInformation/lmi09>

[11] Bureau of Labor Statistics, U.S. Department of Labor. "Public Utilities." *Career Guide to Industries, 2002-2003 Edition*. <http://www.bls.gov/oco/cg/cgs018.htm> The Bureau of Labor Statistics defines public utilities as electric services, gas production and distribution, water supply, sanitary services/ sewage, steam and air-conditioning supply and irrigation systems. It does not reflect the telephone sector.

[12] This figure reflects employment of non-supervisory workers only.

[13] The New Jersey data contained in this chart includes electric services, gas production and distribution, water supply, sanitary services/ sewage, steam and air-conditioning supply and irrigation systems. It does not include the telephone sector.

[14] New Jersey Department of Labor. *Occupational Employment Statistics Wage Survey: 2003 Edition*. January 2003. <http://www.wnjpin.state.nj.us/OneStopCareerCenter/LaborMarketInformation/lmi23/index.html>

[15] Ibid.

[16] New Jersey Department of Labor. *Industry and Occupational Employment Projections*. 2003. <http://www.wnjpin.state.nj.us/OneStopCareerCenter/LaborMarketInformation/lmi04/>

[17] Communications, Telephone and Telegraph. Bureau of Economic Analysis, U.S. Department of Commerce. "Gross Domestic Product by Industry in Current Dollars, 1994-2001." 28 October 2002. <http://www.bea.doc.gov/bea/dn2/gpoc.htm#1994-2001>

[18] Communications. New Jersey Department of Labor. "Gross State Product for New Jersey by Industry, 1977-2001 (Millions of Current Dollars)." 7 July 2003. <http://www.wnjpin.net/OneStopCareerCenter/LaborMarketInformation/lmi09>

[19] The data for this chart reflects the entire telecommunications industry including local telephone service. Bureau of Labor Statistics, U.S. Department of Labor. "Telecommunications." *Career Guide to Industries, 2002-2003 Edition*. <http://www.bls.gov/oco/cg/cgs020.htm>

[20] This figure reflects employment of non-supervisory workers only.

[21] New Jersey Department of Labor. *Occupational Employment Statistics Wage Survey: 2003 Edition*. January 2003. <http://www.wnjpin.state.nj.us/OneStopCareerCenter/LaborMarketInformation/lmi23/index.html>

[22] Ibid.

[23] New Jersey Department of Labor. *Industry and Occupational Employment Projections. 2003*. <http://www.wnjpin.state.nj.us/OneStopCareerCenter/LaborMarketInformation/lmi04/>

[24] Stavros, Richard. "M&A 101: Survival of the Fittest." *Public Utilities Fortnightly*. 15 March 2003. <http://www.fortnightly.com>

[25] Corporate Leadership Council. "FirstEnergy's Answer to the 'Aging' Workforce: Power Systems Institute." December 2002. <www.corporateleadershipcouncil.com>

[26] Wage data for this occupation is for the Electric, Gas, and Sanitary Services only. Mean wage information across all industries was not available for this occupation.

[27] New Jersey Department of Labor. *Industry and Occupational Employment Projections*. 2003. <http://www.wnjpin.state.nj.us/OneStopCareerCenter/LaborMarketInformation/lmi04/>

[28] New Jersey Department of Labor. *Occupational Employment Statistics Wage Survey:* 2003 Edition. January 2003. <http://www.wnjpin.state.nj.us/OneStopCareerCenter/LaborMarketInformation/lmi23/index.html>

[29] Core competencies are a set of skills, knowledge, and abilities a worker needs to master to perform this job.

[30] Corporate Leadership Council. "FirstEnergy's Answer to the 'Aging' Workforce: Power Systems Institute." December 2002. <www.corporateleadershipcouncil.com>

[31] Lewis, Angelo John. Mercer County Workforce Investment Board. "Labor Demand in the New Jersey Utility Industry: Survey Results and Implications." May 2003.

[32] Ibid.

[33] Mercer Community College Course Catalog. 2003

[34] Staff. "Training is key to solving labor shortages," Platts Power. V146, N5. August 2002: p. 71. <http://www.platts.com/engineering/issues/Power/0208/0208pwr_training.shtml>

Appendix A: Methodology

The Workforce Investment Boards of Bergen, Cumberland/Salem, Hudson, Mercer and Passaic counties, in partnership with the New Jersey State Employment and Training Commission, selected the industries for study based on their prevalence in the state and regional economies, their current employment rate, and their potential for job creation.

The Heldrich Center, with input from each WIB, conducted a thorough literature search, or "knowledge inventory," for each industry. The Heldrich Center compiled background research using the Internet and published research reports on the current and emerging national and state trends, and focused on emerging trends and growth projections in the selected industries. The knowledge inventory formed the basis of the industry reports.

The Heldrich Center utilized New Jersey Department of Labor Labor Market Information (LMI) data to create a list of occupations for each industry. The primary criterion was gross openings and expected growth. The secondary criterion was occupations with a shortage of qualified workers and those that displayed a diversity of income and educational levels. The Heldrich Center created a ranking of occupations for review by the WIBs. The WIBs, based on input from each Sectoral Advisory Committee, selected a subset of occupations for study that represented the above criteria and/or their own experience within the industry.

The WIBs convened an Advisory Group for each industry to guide the project. The Advisory Group consisted of employers and other key industry stakeholders. The Advisory Group aided in the selection of occupations for study and provided input regarding report recommendations. The groups met twice throughout the project.

The Workforce Investment Boards, with assistance from the Heldrich Center, Cumberland County College, Mercer County Community College and William Paterson University, convened four or more focus groups for each industry. These focus groups were facilitated by the Heldrich center, and included industry and educational representatives. In addition, the Heldrich Center and its research partners conducted ten or more phone interviews per industry with human resource or key operations managers regarding current and future skill issues and requirements.

Appendix B: Advisory Group Members

Fred Abbate	New Jersey Utilities Association
Joanne Brigandi	South Jersey Gas
Lorna Burt	Mercer County Community College
Calvin Izzard	Verizon Communications-NJ, Mercer County WIB
Angelo Lewis	Lewis Associates
Ginny Minnich	Consumers New Jersey Water Company
Michael Moran	Public Service Electric& Gas
Joyce Owens	NJ American Water
Terrence Seamon	NUI Corporation
Stephanie Wolfe	JCP&L

Appendix C: Focus Group and Interview Participants

Dave Alexander	South Jersey Gas Company
Frank Antisell	Verizon Communications, NJ
Michael Ball	Verizon Communications, NJ
Donna Berry	Verizon Communications, NJ
Nunzio E. Cernero	
Andrew Chapman	Elizabethtown Water Company
Tim Coulter	South Jersey Gas Company
Nancy J. Coyle	Verizon Communications, NJ
Samuel Delgado	Verizon Communications, NJ
Frederick DeSanti	Public Service Electric & Gas
Deborah Fadde	
Gina Gonnella-Bartz	Verizon Communications, NJ
Jim Gootenboer	NJ American Water
Frank Hadley	NJ American Water
Derrick Hall	Verizon Communications, NJ
Tom Harrell	South Jersey Gas Company
Debbie Hughes	Verizon Communications, NJ
Robert Iacullo	United Water New Jersey
Vince Jackson	South Jersey Gas Company
Maryanne Luccarelli	Jersey Central Power & Light Company
Ginny Minnich	Consumers New Jersey Water Company
Tony Nardi	South Jersey Gas Company
Don Olsen	Verizon Communications, NJ
Lenny Onapa	Jersey Central Power & Light Company
Sharon Pennington	South Jersey Gas Company
Frank Peverly	Orange & Rockland Utilities, Inc.
Mike Qaissaunee	
Janice Renella	Orange & Rockland Utilities, Inc.
Mike Roberti	NJ American Water
Rich Ruiz	Verizon Communications, NJ
Nancy Sherman	NJ American Water
Julie Slattery	Verizon Communications, NJ
Janet Smith	Verizon Communications, NJ
John Stowers	Verizon Communications, NJ
Jack L. Waintraub	
Lynn Weinberger	South Jersey Gas Company
Renee Williams	Verizon Communications, NJ
Stephanie Wolfe	Jersey Central Power & Light Company

Appendix D: Profile of Selected Occupations

1. WATER AND LIQUID WASTE TREATMENT PLANT AND SYSTEM OPERATORS

Water and Liquid Waste Treatment Plant and System Operators operate or control an entire system of machines, often through the use of control boards, to transfer or treat water or liquid waste. One of the major tasks of a worker in this occupation is operating or adjusting equipment to purify and clarify water, process or dispose of sewage or generate power. Another task is adding chemicals to water and other liquids to disinfect and deodorize them. A third task is collecting and testing water and sewage samples, using test equipment and color analysis. In addition, water and liquid waste treatment plant and system operators inspect and monitor equipment and operating conditions to determine load requirements and detect malfunctions. Finally, other tasks that a worker in this occupation might do are: maintain, repair and lubricate materials using hand tools and power tools, clean and maintain tank and filter beds, and record operational data and meter and gauge readings on specified forms.

Water and Liquid Waste Treatment Plant and System Operators must have a thorough understanding and must strictly adhere to any and all safety precautions and procedures. In addition, workers in this category must have knowledge of chemical composition, and properties of substances and the chemical processes they undergo. They must also be able to understand the interaction between chemicals and the safety precautions associated with them. Workers in this category must have the mechanical aptitude to adjust pumps and motors and change settings of pumps for different flow rates. In addition, they must also understand and be able to conduct a bacteria analysis. Finally, employers tell us that Water and Liquid Waste Treatment Plant and System Operators must have computer literacy skills and be able to multi-task.

Generally, workers in this category must have a high school diploma or GED. They must also possess the state license, at a minimum a TI license. Employers report that the state licensure is one of the main challenges within the water sector workforce because it is difficult to find applicants with the appropriate state license. Also, employers seem generally displeased with prospective employees' basic reading and math skills. However, according to New Jersey water employers, there is so little turnover in these types of positions that employers do not hire in large-scale amounts. As a result, the issue is not as problematic as it might be in other sectors of utilities.

2. COMMUNICATION EQUIPMENT MECHANICS, INSTALLERS, AND REPAIRERS

Communication Equipment Mechanics, Installers and Repairers in the utilities industry install, maintain, test and report communication cables and equipment for providers of local telephone service. Workers in this category examine and test malfunctioning equipment to determine defects, while using blueprints and electrical measuring instruments. They also repair and replace defective components and test installed equipment for conformance to specifications. Installing communication equipment also involves assembling and installing data communication lines and equipment, computer systems, and antennas and towers, using hand tools. Finally, workers in this category perform routine maintenance on equipment and repair equipment in accordance with customer requests.

Communication equipment mechanics, installers, and repairers must have a thorough understanding of safety regulations and procedures and strictly adhere to them on the job. They must also have keen critical thinking and problem solving skills. Further, communication equipment mechanics, installers and repairers must have precise application of tools, especially hand tools. More than ever, workers in this category must be able to effectively use technology as it is applied in utilities operations and be able to learn new ideas quickly. They must also be able to handle multiple tasks at one time and work independently. Finally, employers tell us that the ability to speak multiple languages is not required but is becoming more important.

Technological advances in instrumentation have resulted in increased skill demands on communication equipment mechanics, installers, and repairers. Instrumentation is much more technical and automated and workers must possess the basic computer skills to adapt to them. Workers must also be able to perform many of their key work functions from mobile computer units in trucks and handheld devices.

3. FIRST-LINE SUPERVISORS OF MECHANICS, INSTALLERS AND REPAIRERS

First-line supervisors of mechanics, installers and repairers oversee and coordinate the work of front-line skilled and trade workers. They also manage work sites to ensure that work methods and procedures are kept on schedule and within budget. First-line supervisors also coordinate personnel actions for mechanics, installers, and repairers such as training, performance evaluations, promotions, transfers and disciplinary measures. Often, first-line supervisors must work with union representatives to solve problems and coordinate work activities. Workers in this category also conduct research on a work site before a job starts to ensure there are no environmental hazards. Finally, first-line supervisors must interpret blueprints and job orders and inspect completed work to verify conformance to standards.

First-line supervisors must have business and accounting skills to monitor project budgets. They must also possess good communication skills and be able to convey accurate information to labor and skilled workers, union representatives, and multiple project partners. Workers in this category must also have a thorough understanding of safety regulations and procedures and strictly adhere to and enforce them. Most importantly, employers tell us that first-line supervisors of mechanics, installers and repairers must have the ability to analyze situations and identify solutions to problems on the work site in a way that meets business goals.

The most significant trend facing first-line supervisors of mechanics, installers and repairers in the utilities industry is the increasing demand for business-oriented and leadership skills. The multiple ranks of workers no longer exist. Instead, first-line supervisors must be decision-makers on important project decisions as opposed to going to a higher-ranked employee. For this reason, workers in this position must be independent, proactive and understand their role in the mission of the larger organization.

4. COMPUTER SOFTWARE ENGINEERS, SYSTEMS SOFTWARE

Computer software engineers research, design, develop and test operating systems-level software, computers and network distribution software for the utilities industry, among many others. Workers in this category make the majority of the technology decisions for a firm. In doing so, workers analyze the software requirements of a firm and develop a plan for the types of computers a firm will use and the peripheral equipment modifications to existing systems. Computer software engineers also evaluate the overall performance of the computer hardware and software systems within a firm. They interface with project managers and others within a firm to determine limitations and capabilities for data processing projects. Finally, workers in this category coordinate the installation of software systems and monitor them to ensure the software conforms to specifications.

Computer software engineers must have the ability to understand complex computer networking and software systems as well as have as thorough understanding practical applications of engineering science and technology. They must also have advanced mathematical and arithmetic skills. Workers in this category must have an in-depth understanding of how technology is integrated into the operations of the firm. Finally, computer software engineers must be able to secure data and provide high levels of security to a firm's data systems.

5. NETWORK SYSTEMS AND DATA COMMUNICATIONS ANALYSTS

Network systems and data communications analysts analyze, design, test and evaluate network systems including local area networks, wide area networks, Internet, intranet and other data communications systems. Workers in this category analyze and recommend hardware and software for a firm to purchase. They also maintain the network, which includes identifying areas of operation that need upgraded equipment. Network systems and data communications analysts often have to train users on how to use the hardware and software of a system.

Network systems and data communications analysts must have a high school diploma or a general equivalency diploma, at a minimum. Often, however, a bachelor's degree is preferred. In almost all cases, workers in this category must possess advanced technical certification to stay abreast of rapidly changing technologies. Employers agree that network systems and data communications analysts must have the ability to understand the needs of the firm and to identify products that meet those needs. In addition, they must be able to effectively communicate with users according to their level of computer understanding. Employers also tell us that workers in this category must be able to teach users how to use the firm's computer systems. Finally, network systems and data communications analysts must be able identify system malfunctions, such as computer viruses, and resolve them quickly.

Constant technological advances have resulted in increased skill demands on network systems and data communications analysts, who must now consistently be involved in continuous learning about new computer hardware and software. At the same time, they must keep their skills and knowledge up-to-date on frequent threats to computer security and their solutions.

6. COMPUTER SYSTEMS ANALYSTS

Computer systems analysts analyze the data processing problems for application to electronic data processing systems. Similar to a computer software engineer, computer systems analysts analyze user requirements, procedures and problems to automate, or improve, the data processing system. Workers in this category also document a computer system's capabilities and analyze its usability within a firms' operational structure.

According to utilities employers, most computer systems analysts have a bachelor's degree but an associate's degree is often the only degree required. Most workers in this category have extensive vocational and on-the-job training. Computer systems analysts must have a thorough understanding of the utilities industry and how technology works within the larger operational structure of the firm. They must also have extensive complex analytic and critical-thinking skills. Workers in this category must have in-depth knowledge of computer networking, systems applications, and computer programming.

The most important workforce trend facing computer systems analysts is the increasing sophistication of the user community and the need for analysts to consistently keep upgrading their level of knowledge. It is essential that computer systems analysts stay ahead of end users with regard to knowing what technological tools are in the future.